

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 04 MAY 2006

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Applicant's or agent's file reference 56.454 Mü/Sei/pn	FOR FURTHER ACTION	
	See Form PCT/IPEA/416	
International application No. PCT/EP2004/014504	International filing date (day/month/year) 20.12.2004	Priority date (day/month/year) 23.12.2003

International Patent Classification (IPC) or national classification and IPC
INV. H04N9/31 G02B27/28

Applicant
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<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 3 sheets, as follows:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>
<p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application

Date of submission of the demand 21.10.2005	Date of completion of this report 28.04.2006
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer Ward, S Telephone No. +31 70 340-3547



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/014504

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
 - international search (under Rules 12.3 and 23.1(b))
 - publication of the international application (under Rule 12.4)
 - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-16 as originally filed

Claims, Numbers

1-12 received on 21.10.2005 with letter of 21.10.2005

Drawings, Sheets

1/7-7/7 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. The amendments have resulted in the cancellation of:
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):
4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-12
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-12
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-12
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

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Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. D1: US2001030779

D2: EP1063852

D3: US5042921

2.1 The amendments filed with the letter dated 21.10.2005 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendment concerns the feature:

"whereby the respective collinearity and coincidence properties of said first and second directions (Z1, Z2) with respect to each other are realized by a single optical folding element (10) only".

2.2 No basis for this amendment can be found in the application documents as originally filed. The subject-matter which comes closest to this feature appears to be found in the description on page 5, lines 22-26:

"According to an inventive solution this may be achieved by a particular simple design for compact and high efficient unit for a micro display based projection unit or the like. Only one or a single beam splitter surface is involved for performing a threefold optical interaction, i.e. it is involved three times and the surface is hit three times by the light".

The feature mentioned in paragraph 2.1, however, goes beyond this disclosure to include, for example, optical folding elements which are not beam splitter elements, or which do not perform a threefold optical interaction. There is no basis for such embodiments in the application as filed, contrary to Article 34(2)(b) PCT.

2.3 For the purposes of examination, claim 1 is interpreted as if the objection under Article 34(2)(b) PCT had been overcome, by modifying the feature mentioned in paragraph 2.1 to ensure that it has a clear basis in the subject-matter mentioned in paragraph 2.2. Such a modification could suitably be:

characterised in that said image generation unit comprises only a single beam splitter surface (10s), such that light which is output by said image generation unit has been incident on said single beam splitter surface three times, thereby

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realising the respective collinearity and coincidence properties of said first and second directions (Z1, Z2) with respect to each other.

- 3.1 Claim 1, construed as incorporating the feature mentioned in paragraph 2.3, above, appears to satisfy the requirements of Article 33(2) and 33(3) PCT for the following reasons: The document D1 discloses (see e.g. figures 2,3,5): An image generation unit with a light input section (58,60,62) for receiving primary illumination light along a first or light incidence direction, an image generation element (66,68), which is adapted for producing an image by using said primary illumination light and for thereby generating secondary illumination light and a light output section (62) which is adapted for emitting said secondary illumination light or a derivative thereof as tertiary illumination light being representative for [sic] said image into a second or image emission direction, wherein said light input or [sic] section and said light output section are arranged in a manner that said first or light incidence direction and said second or image emission direction are one of collinear coincident [sic] with respect to each other.
- 3.2 Claim 1, construed in the above-mentioned manner, differs from D1 in the features mentioned in paragraph 2.3, above. In the most relevant prior art documents, the analogous collinearity or coincidence properties are achieved by:
Document D1: One polarising beamsplitter (62) and two dichroic beamsplitters (76,78), none of which are triple-passed;
Document D2: First and second mirrors (13, 14) and a colour-wheel (17), none of which are triple-passed;
Document D3: Two polarising beamsplitters (613,614) and two mirrors (615,616), none of which are triple-passed.
Thus the distinguishing features of claim 1 are not disclosed or suggested in the available prior art, and hence claim 1, construed in the manner explained in paragraph 2.3, is considered to involve an inventive step (Article 33(3) PCT).
4. Claims 2-12 depend on claim 1 and therefore satisfy the requirements of Article 33(2) and 33(3) PCT.

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New Claims

- 1 1. Image generation unit for an image projection device:
 - comprising a light input section (30i) which is adapted for receiving primary illumination light (L1) from a first or light incidence direction (Z1)
 - comprising an image generation element arrangement (60) which is adapted for producing an image (I) by using said primary illumination light (L1) or a derivative thereof and for thereby generating secondary illumination light (L2), and
 - comprising a light output section (30o) which is adapted for emitting said secondary illumination light (L2) or a derivative thereof as tertiary illumination light (L3) being representative for said image into a second or image emission direction (Z2),
 - wherein said light input or section (30i) and said light output section (30o) are arranged in a manner that
 - said first or light incidence direction (Z1) and said second or image emission direction (Z2) are one of collinear coincident with respect to each other and
 - whereby the respective collinearity and coincidence properties of said first and second directions (Z1, Z2) with respect to each other are realized by a single optical folding element (10) only.
- 20 2. Image generation unit according to claim 1,
 - wherein a polarization selective beam splitting device (10) is provided as said single optical folding element (10),
 - said polarization selective beam splitting device (10) having a light input section (10i) serving as said light input section (30i) of said image generation unit (30) or as a part thereof and
 - said polarization selective beam splitting device (10) having a light output section (10o) serving as said light output or light emission section (30o) of said image generation unit (30) or as a part thereof.
- 30 3. Image generation unit according to claim 2,
wherein said polarization selective beam splitting device (10) is a beam splitting cube (10), a first pair of opposing surfaces (10i, 10o) of which serving as said light input or light incidence surface (30i) or section (30i) of said image generation unit (30) or as a part thereof and as said light output or light emission surface (30o) or section (30o) of said image generation unit (30) or as a part thereof, respectively.

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- 1 4. Image generation unit according to any one of the preceding claims 2 or 3,
wherein said polarization selective beam splitting device (10) comprises a polar-
ization selective beam splitting interface (10s) which is adapted to reflect light
of a first or p-polarized/s-polarized polarization state and which is adapted to
5 transmit light of a second or s-polarized/p-polarized polarization state.
- 10 5. Image generation unit according to any one of the preceding claims,
wherein at least one of said image generation element arrangement (60), ele-
ments thereof and parts thereof are positioned outside a path or passage de-
fined by said first and second directions (Z1, Z2), outside said polarization se-
lective beam splitting device (10) and its polarization selective beam splitting in-
terface (10s).
- 15 6. Image generation unit according to any one of the preceding claims,
wherein said image generation arrangement (60) comprises a reflective imager
panel element (61) in the form of a LCD-panel being adapted to controllably ge-
nerate an image.
- 20 7. Image generation unit according to any one of the preceding claims,
wherein said image generation element arrangement (60) comprises a mirror
(62) which is adapted and arranged to receive light reflected by said polarization
selective beam splitting interface (10s) or a derivative thereof and to reflect said
received light back, thereby changing its polarization state from p to s and from
s to p, respectively.
- 25 8. Image generation unit according to any one of the preceding claims,
wherein said image generation element arrangement (60) comprises a color swit-
ching element (63) which is adapted to controllably generate at least one first
spectral component of incident light and to avoid transmission of the compli-
mentary spectral range of said at least one first spectral range.
- 30 9. Image generation unit according to claim 8,
wherein said color switching element (63) is or comprises a quarter wave retar-
der (63-2) and a reflective electronic color switch (63-2).

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- 1 **10.** Image generation unit according to any one of the preceding claims,
- wherein said imager panel element (61), on the one hand, and said reflective arrangement (62) together with said color switching element (63), on the other hand, are arranged at or in a second pair of opposing sections (10p, 10c; 30p, 30c) of said image generation unit (30) and of said polarization selective beam splitting device (10),
5 - said opposing sections (10p, 10c; 30p, 30c) being different from said light input or light incidence section (30i) and said light output or light emission section (30o) of said image generation unit (30) and further
10 - said opposing sections (10p, 10c; 30p, 30c) being different from said light input section (10i) and said light output section (10o) of said polarization selective beam splitting device (10).
- 15 **11.** Image generation unit according to any one of the preceding claims,
wherein said opposing sections (10p, 10c; 30p, 30c) of said image generation unit (30) and of said polarization selective beam splitting device (10) are perpendicularly oriented with respect to said light input or light incidence section (30i) and said light output or light emission section (30o) of said image generation unit (30) and perpendicularly oriented with respect to said light input section (10i) and said light output section (10o) of said polarization selective beam 20 splitting device (10).
- 25 **12.** Image projection device, comprising:
- an illumination unit (20) which is adapted for generating primary illumination light (L1),
- an image generation unit (30) which is adapted to receive said primary illumination light (L1) and to generate and emit an image (I), and
- a projection unit (40) which is adapted to receive and project said image (I),
- wherein said image generation unit (30) is formed according to any one of
30 the preceding claims 1 to 11.